
Developmental Cryogenic Active Telescope Testbed (DCATT)

NGST Quarterly Review

October 9, 1997

DCATT Team

DCATT Phase I Objectives

- ◆ Test in hardware a system having the functional elements of NGST and validate models which can be scaled to predict NGST performance
- ◆ Explore wavefront sensing/control techniques and algorithms and their ability to reduce large wavefront errors to diffraction limited values.
- ◆ In support of higher objectives and NGST, become expert with active optical technology through hands-on experience

Configuration

- ◆ 1 central, 6 outer hexagon segments, ~ 92 centimeter inscribed diameter
 - ★ Segment sizes allow realistic sizing of actuation devices and coupling hardware
 - ★ Segment size/shape => lightweight enough to avoid gravity offloading or non-rigid segment concerns
 - ★ 7 segments => appropriate complexity for testing WFS&C schemes/SW => can be rolled into NGST

Configuration

- ◆ Vertical optical axis
 - ★ Uniform axisymmetric gravity load on primary mirror segments
 - ★ Compact system which can most easily be supported as a connected system on vibration isolation
 - ★ Matches Phase II cryo system planned configuration
 - ★ Eases design of actuation coupling HW - no significant moment loading from segments.
- ◆ Telescope tested in autocollimation

Configuration

◆ Aft optics bench

- ★ Stimulus design encompasses planned functions

 - » Alignment

 - » Source

 - » Scoring

 - » Aberration Generation

- ★ Fast Steering Mirror does not need to be in collimated space - now in converging beam

DCATT System Peer Review

- ◆ No major issues. Some concerns. Many helpful suggestions
 - ★ Effect of lab thermal variations on ability to do WFS & C
 - ★ Support of heavy autocollimating flat above telescope
 - ★ Design system to be able to do IR testing at 2 microns in order to clearly demonstrate science performance
- ◆ Package with responses to peer review comments ready within next 2 weeks.

Status and Near-Term Plans

◆ Telescope fabrication

- ★ Begin cutting aluminum blanks this week
- ★ Final mechanical analyses completed this week
- ★ Begin machining of segment backs next week
- ★ Front surface optical tolerances complete next 2 weeks
- ★ Design & analysis of baseplate & surround ongoing
- ★ Agreements being worked through MSFC with ORNL (diamond turning) & UoAriz. (polishing)
- ★ Plan to start 1st diamond turning in early December

Status and Near-Term Plans

- ◆ Stimulus and Wavefront Sensor (WFS)
 - ★ Design and analysis of Dispersed Fringe Sensor (DFS) for WFS ongoing
 - ★ Rethinking complexity of Stimulus. Plan now for separate Stimulus & Interferometric WFS (IWFS). Stimulus to include sources & aberration generators = > pushed first. IWFS for scoring, 2nd priority - also provides 2nd stand alone WFS device having potential for use on NGST. No double pass now on AO bench
 - ★ Design & analysis of new Stimulus & IWFS ongoing

Status and Near-Term Plans

- ◆ Modeling, controls, SW development
 - ★ Plan, task list, and schedule nearing completion
 - ★ GSFC DCATT personnel coming up to speed with NGST modeling tools
 - ★ Present system models being used to conduct sensitivity analyses & generate subsystem tolerances
 - ★ In process of getting support from Code 730 for electrical I&T and software development

Status and Near-Term Plans

- ◆ 6 DOF PM segment actuation mechanism being investigated
- ◆ Mechanical structure design progress on schedule
- ◆ Procurements - Deformable Mirror, CCD cameras, motorized stages ready for procurement when FY98 funding available
- ◆ Plans underway for near-term test setup - breadboarded dispersed fringe sensor with small segmented mirror setup (TBD number segments)